

FORM PTO-1300 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER: 0512-1001 U.S. APPL. NO. (if known, see 37 CFR 1.52) 10/031489
INTERNATIONAL APPLICATION NO.: PCT/FR00/01742	INTERNATIONAL FILING DATE: 22 JUNE 2000	PRIORITY DATE CLAIMED: 21 JULY 1999
TITLE OF INVENTION: COATING COMPOSITION FOR CHEESES		
APPLICANT(S) FOR DO/EO/US: Marie-Helene CHASSAGNE, Annie IMBERT, Jean GRAILLE, Michel PINA, Serge LAURENT		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/> 2. <input type="checkbox"/> 3. <input checked="" type="checkbox"/> 4. <input checked="" type="checkbox"/> 5. <input checked="" type="checkbox"/> 6. <input type="checkbox"/> 7. <input checked="" type="checkbox"/> 8. <input type="checkbox"/> 9. <input type="checkbox"/> 10. <input type="checkbox"/> 11. <input checked="" type="checkbox"/> 12. <input type="checkbox"/> 13. <input checked="" type="checkbox"/> 14. <input type="checkbox"/> 15. <input type="checkbox"/> 16. <input checked="" type="checkbox"/>	This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau. (see attached copy of PCT/IB/308) c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). A translation of the International Application into English (35 U.S.C. 371(c)(2)). Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Item 11. to 16. below concern document(s) or information included: An Information Disclosure Statement under 37 CFR 1.97 and 1.98. An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. A FIRST preliminary amendment. A SECOND or SUBSEQUENT preliminary amendment. A substitute specification. A change of power of attorney and/or address letter. Other items or information:	
International Search Report PCT/IPEA/409 Application Data Sheet		
PCT/IB/304 PCT/IB/306 Abstract of the Disclosure on a Separate Sheet		

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

10/031489

INTERNATIONAL APPLICATION NO.
PCT/FR00/01742ATTORNEY'S DOCKET NO.
0512-100117. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO

\$ 1,040.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO

\$ 890.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO

\$ 740.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)

\$ 710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)

\$ 100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$ 890.00

Surcharge of \$130.00 for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

\$ 130.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	33 - 20 =	13	X \$18.00	\$	234.00
Independent claims	2 - 3 =	0	X \$84.00	\$	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ \$280.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$	1,254.00
Reduction of 1/2, if applicant is entitled to Small Entity status under 37 CFR 1.27.				+	\$
SUBTOTAL =				\$	1,254.00
Processing fee of \$130 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$	1,254.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$
TOTAL FEES ENCLOSED =				\$	1,254.00
				Amount to be refunded:	
				charged:	

- a. ☒ A check in the amount of \$ **1,254.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. **25-0120** in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. **25-0120**. A duplicate copy of this sheet is enclosed.

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January 22, 2002

By

Benoît Castel
 Benoît Castel
 Attorney for Applicants
 Registration No. 35,041

PATENT
0512-1001

IN THE U.S. PATENT AND TRADEMARK OFFICE

In re application of: Marie-Helene CHASSAGNE et al.

Appl. No.:

Group:

Filed:

January 22, 2002

Examiner:

For:

COATING COMPOSITION FOR CHEESES

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

January 22, 2002

Sir:

The following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

IN THE SPECIFICATION:

Please replace the paragraph beginning on page 9, line 13, with the following rewritten paragraph:

-- It is also possible, in order to improve the properties of the coatings of the invention, to add to these coatings an amount ranging up to 20%, advantageously between 5 and 15%, of a plasticizer. Generally, these plasticizers are polymer materials. Mention may be made in particular of copolymers of butyl acrylate or butyl methacrylate and of ethylene, copolymers of vinyl acetate and of ethylene acetate,

or other polymer substances miscible with the basic substances and capable of having an influence either on the rheological properties of the coating composition during the coating process, or on the properties of the final coatings themselves.--

Please replace the paragraph beginning on page 10, line 5, with the following rewritten paragraph:

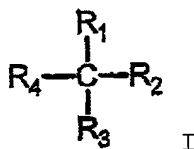
--The subject of the invention is also a process for preparing a coating composition as defined above, wherein an esterification reaction is carried out between at least one polyol as defined above with at least one fatty acid of a first group (A) and at least one fatty acid of a second group (B) as defined above and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid as defined above, advantageously present in a B/A molar ratio between 0.8 and 1.5, advantageously between 1 and 1.3, and, optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate, is added to the esterification product obtained.--

IN THE CLAIMS:

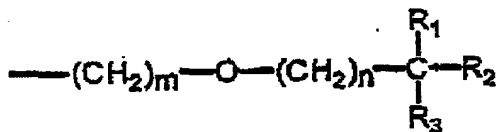
Please amend the claims as follows:

--3. (amended) The process as claimed in claim 1, wherein the polyol containing a branched chain comprises a neopentyl group.--

--4. (amended) The process as claimed in claim 1, wherein the polyol containing a branched chain corresponds to the general formula:



in which R_1 , R_2 , R_3 and R_4 , which may be identical or different, are selected from a C_1 - C_6 alkyl group, in particular a methyl or ethyl group, or a C_1 - C_6 hydroxyalkyl group, in particular a hydroxymethyl group; or R_4 represents a group



m and n , which may be identical or different, being an integer from 1 to 6, advantageously 1 to 3, preferably equal to 1, R_1 , R_2 and R_3 being as defined above, provided that at least two from R_1 to R_4 are a C_1 - C_6 hydroxyalkyl group.--

--12. (amended) The process as claimed in claim 6, wherein the B/A molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.--

--13. (amended) The process as claimed in claim 1, wherein the coating comprises at least one polycarboxylic, in particular C₃-C₁₆ dicarboxylic, acid esterified with the polyol via one or two of its carboxylic functions.--

--15. (amended) The process as claimed in claim 1, wherein the alcohol function (of the polyol) to acid function (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, and advantageously between 1 and 2.--

--16. (amended) The process as claimed in claim 13, wherein the coating composition comprises from 0 to 20% by weight of polycarboxylic, in particular dicarboxylic, acid relative to the total weight of the coating composition.--

--17. (amended) The process as claimed in claim 1, wherein the coating composition contains a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate.--

--23. (amended) The composition as claimed in claim 18, wherein the fatty acids (A) are saturated or

unsaturated fatty acids having more than 12 carbon atoms.--

--25. (amended) The composition as claimed in claim 18, wherein the acids (B) are saturated or unsaturated acids having from 1 to 12 carbon atoms.

--27. (amended) The composition as claimed in claim 18, wherein (A) is present at from 50 to 75% by weight relative to the total weight of the fatty acids and (B) is present at 50 to 100% by weight relative to the total weight of the fatty acids.--

--28. (amended) The composition as claimed in claim 18, wherein the A/B molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.--

--29. (amended) The composition as claimed in claim 18, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a polycarboxylic acid, in particular a dicarboxylic acid, especially a C₃-C₁₆ dicarboxylic acid, the dicarboxylic acid being present in free form and/or in a form esterified with the polyol.--

--30. (amended) The composition as claimed in claim 18, wherein the number of alcohol functions (of the polyol)/number of acid functions (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, advantageously between 1 and 2.--

--31. (amended) The composition as claimed in claim 18, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate.--

--32. (amended) A process for preparing a coating composition as claimed in claim 18, wherein an esterification reaction is carried out between at least one polyol with at least one fatty acid of a first group (A) and at least one acid of a second group (B) and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid and, optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate, is added to the esterification product obtained.--

--33. (amended) A coated cheese comprising a coating obtained according to the process of claim 1.--

REMARKS

Claims 1-33 are pending in the present application.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly requested.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE."

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

YOUNG & THOMPSON



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BC/ia
Attachments

VERSION WITH MARKINGS TO SHOW CHANGES MADEIN THE SPECIFICATION:

The paragraph beginning on page 9, line 13, has been amended as follows:

It is also possible, in order to improve the properties of the coatings of the invention, to add to these coatings an amount ranging up to 20%, advantageously between 5 and 15%, of a plasticizer. Generally, these plasticizers are polymer materials. Mention may be made in particular of copolymers of ~~methacrylate or butyl acrylate or butyl methacrylate~~ and of ethylene, copolymers of vinyl acetate and of ethylene acetate, or other polymer substances miscible with the basic substances and capable of having an influence either on the rheological properties of the coating composition during the coating process, or on the properties of the final coatings themselves.

The paragraph beginning on page 10, line 5, has been amended as follows:

The subject of the invention is also a process for preparing a coating composition as defined above, wherein an esterification reaction is carried out between at least one polyol as defined above with at least one fatty acid of a first group (A) and at least one fatty acid of a second group (B) as defined above and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid as defined

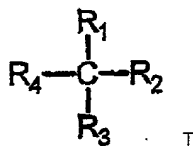
above, advantageously present in a B/A molar ratio between 0.8 and 1.5, advantageously between 1 and 1.3, and, optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of ~~methacrylate or butyl acrylate or butyl methacrylate~~ and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate, is added to the esterification product obtained.

IN THE CLAIMS:

The claims have been amended as follows:

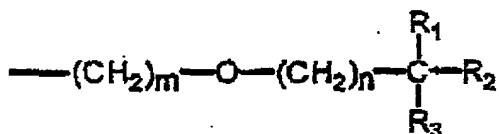
3. The process as claimed in claim 1 ~~or claim 2~~, wherein the polyol containing a branched chain comprises a neopentyl group.

4. The process as claimed in ~~any one of the preceding claims,~~ claim 1, wherein the polyol containing a branched chain corresponds to the general formula:



in which R_1 , R_2 , R_3 and R_4 , which may be identical or different, are selected from a C_1 - C_6 alkyl group, in particular a methyl or ethyl group, or a C_1 - C_6

hydroxyalkyl group, in particular a hydroxymethyl group;
or R₄ represents a group



m and n, which may be identical or different, being an integer from 1 to 6, advantageously 1 to 3, preferably equal to 1, R₁, R₂ and R₃ being as defined above, provided that at least two from R₁ to R₄ are a C₁-C₆ hydroxyalkyl group.

12. The process as claimed in ~~any one of claims 6 to 10~~, claim 6, wherein the B/A molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.

13. The process as claimed in ~~any one of the preceding claims~~, claim 1, wherein the coating comprises at least one polycarboxylic, in particular C₃-C₁₆ dicarboxylic, acid esterified with the polyol via one or two of its carboxylic functions.

15. The process as claimed in ~~any one of the preceding claims~~, claim 1, wherein the alcohol function (of the polyol) to acid function (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, and advantageously between 1 and 2.

16. The process as claimed in ~~either of claims 13 and 14,~~claim 13, wherein the coating composition comprises from 0 to 20% by weight of polycarboxylic, in particular dicarboxylic, acid relative to the total weight of the coating composition.

17. The process as claimed in ~~any one of the preceding claims,~~claim 1, wherein the coating composition contains a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate.

23. The composition as claimed in ~~one of claims 18 to 22,~~claim 18, wherein the fatty acids (A) are saturated or unsaturated fatty acids having more than 12 carbon atoms.

25. The composition as claimed in ~~any one of claims 18 to 24,~~claim 18, wherein the acids (B) are saturated or unsaturated acids having from 1 to 12 carbon atoms.

27. The composition as claimed in ~~any one of claims 18 to 26,~~claim 18, wherein (A) is present at from 50 to 75% by weight relative to the total weight of the fatty acids and (B) is present at 50 to 100% by weight relative to the total weight of the fatty acids.

28. The composition as claimed in ~~any one of claims 18 to 27,~~claim 18, wherein the A/B molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.

29. The composition as claimed in ~~any one of claims 18 to 28,~~claim 18, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a polycarboxylic acid, in particular a dicarboxylic acid, especially a C₃-C₁₆ dicarboxylic acid, the dicarboxylic acid being present in free form and/or in a form esterified with the polyol.

30. The composition as claimed in ~~any one of claims 18 to 29,~~claim 18, wherein the number of alcohol functions (of the polyol)/number of acid functions (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, advantageously between 1 and 2.

31. The composition as claimed in ~~any one of claims 18 to 30,~~claim 18, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate.

32. A process for preparing a coating composition as claimed in ~~any one of claims 18 to 31,~~claim 18, wherein an esterification reaction is carried out between at least one polyol~~as defined in claims 1 to 6~~ with at least one fatty acid of a first group (A) and at least one acid of a second group (B)~~as defined in claims 6 to 12~~ and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid~~as defined in~~

~~claims 13 to 15,~~ and, optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate, is added to the esterification product obtained.

33. A coated cheese comprising a coating obtained according to the process of ~~claims 1 to 17, or as defined in~~ ~~claims 18 to 32.~~ claim 1.

WO 01/05240

Coating composition for cheeses

The present invention relates to a process for coating cheeses. It also relates to novel coating compositions
5 for cheeses, and also to a process for manufacturing these coatings.

Some cheeses, more particularly pressed cheeses, are preserved in a protective coating, which avoids,
10 firstly, the cheese drying out and, secondly, the cheese being spoiled by molds. Several types of coating are widely used for this purpose or have been described to this effect.

15 Mention may be made in particular of:

- coverings based on synthetic plastic materials of the vinyl acetate polymer type; in this case the coating is relatively permeable to water and to gases;
20 moreover, this coating or covering is generally relatively thin and adheres to the surface of the cheese, and in order for it to be removed, the cheese needs to be derinded.

25 - coating compositions which advantageously use the melting/crystallization properties of their constituents, which are liquid at the temperatures for coating the cheeses, by soaking or spraying (45 to 90°C), and waxy and solid at room temperature.

30 These materials should be plastic and pliable in nature, should not easily break and should not adhere to the cheese upon their removal when the cheeses are eaten.

35 These compositions generally consist of one or more layers, of variable thickness, of hydrocarbon waxes consisting of a mixture of paraffins, of

microcrystalline waxes and, optionally, of mineral oils. This type of coating and its method of application are described in FR 1 453 977.

- 5 - acetylated monoglycerides in the molten state, which have the property of solidifying in the form of polymorphic crystals during cooling to room temperature, giving waxy, non-greasy and relatively flexible products. These properties have made it possible to suggest the use of these products as coatings, in particular for cheeses.

Thus, EP 0 141 299 describes more particularly a coating for cheeses consisting of a first internal layer based on a mixture of acetic acid esters of fatty acid monoglycerides, and of a second external layer consisting of a conventional wax for coating cheese.

EP 0 403 030 describes a coating composition for cheeses, consisting of a mixture of mono- and diglycerides esterified with various acids (acetic, lactic, citric) and of waxes of plant origin.

EP 0 679 337 describes a coating composition for cheeses, consisting of acetylated monoglycerides obtained from long-chain fatty acids (more than 80% by weight of stearic and behenic acid) having a high melting point and a short solidifying time.

Finally, EP 0 811 664 describes a coating composition for cheeses, advantageously comprising fatty acid mono- and diglycerides combined with a resinous substance which is a methyl ester of hydrogenated colophony, a hydrogenated colophony esterified with glycerol, or a mixture thereof.

However, the various compositions set out above have drawbacks when they are used as coatings for cheeses.

Thus, the hydrocarbon waxes, despite excellent functional properties, have a negative environmental effect and, although the innocuity of the hydrocarbon categories used has been acknowledged, their use is likely to be limited sooner or later by the regulations of certain countries.

The coatings consisting mainly of fatty acid mono- and diglycerides have, depending on the cases, the following deficiencies:

- a mechanical resistance (shock resistance) which is generally poorer than the hydrocarbon waxes;
- a brittle nature with a tendency to flake upon their removal when the cheese is eaten, in particular when the coating is opened using a band (tear-strip) when high melting-point products obtained from long-chain fatty acids are used;
- a sticky and greasy feel for products obtained from shorter-chain fatty acids.

Although, in general, these coatings have good plastic properties at temperatures close to room temperature, it is noted that these coatings do not behave as well at temperatures clearly above or below room temperature, likely to occur during the cheese distribution cycle. Thus, some products appear to be too brittle at temperatures of about 4°C, whereas others are very sticky in nature with the appearance of "oiling", sticking to the outer packaging, or possible migration of dyes or of glyceric components of the packaging.

Finally, the constituents of these coatings have a chemical structure which is very close to that of the triglycerides of the cheese, which may promote their miscibility and their possible entrainment into the

cheese, accompanied by entrainment of liposoluble dye; in addition, these products are sensitive to the action of the lipases present in cheeses, as confirmed by pancreatic lipase-sensitivity tests.

5

Since these products are likely to be degraded upon contact with the enzymes of the microorganisms of the cheese, flavor defects may appear during aging of the cheeses.

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Moreover, studies carried out by the Applicant show that waxes obtained by esterification of fatty acids and of fatty alcohols produce results which are unsuitable for their use as cheese coatings.

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Specifically, although these compositions have a thermal behavior (curve of solids content as a function of temperature) close to cheese waxes based on hydrocarbons of petroleum origin, the cheese coatings produced from these components are generally brittle whatever the diversity of the fatty chains used, this being even in the presence of diverse additives capable of slowing down the crystallization of these waxes.

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The aim of the present invention is to provide coatings whose properties are improved compared to the coatings described in the prior art, in particular a coating having mechanical properties which are satisfactory at room temperature but also at extreme temperatures likely to occur, including accidentally, in the cheese cycle, which is neither brittle nor sticky, the constituents of which do not migrate into the cheese, which is totally innocuous and which can be easily detached when the cheese is eaten.

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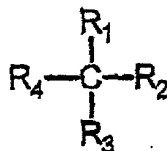
The subject of the invention is thus a process for coating cheeses, in particular pressed cheeses, wherein a coating composition is applied onto whole cheeses or portions of cheese, which coating composition comprises from 60% to 100% by weight of a product of

esterification of at least one fatty acid and at least one polyol containing a branched chain having at least 3 carbon atoms and at least 2 OH groups.

5 For the purpose of the present invention, the polyol advantageously comprises at least 5 carbon atoms, the hydrocarbon-based backbone advantageously being saturated. Polyols comprising a substituted neopentyl group are particularly preferred.

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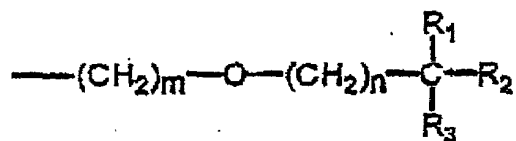
Preferably, the polyol according to the invention corresponds to the general formula:



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in which R_1 , R_2 , R_3 and R_4 , which may be identical or different, are selected from a C_1 - C_6 alkyl group, in particular a methyl or ethyl group, or a C_1 - C_6 hydroxyalkyl group, in particular a hydroxymethyl group; or R_4 represents a group

20



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m and n , which may be identical or different, being an integer from 1 to 6, advantageously 1 to 3, preferably equal to 1, R_1 , R_2 and R_3 being as defined above, provided that at least two of R_1 to R_4 are a C_1 - C_6 hydroxyalkyl group.

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Among the preferred polyols, mention may be made in particular of pentaerythritol, neopentyl glycol, trimethylolethane, trimethylolpropane and dipentaerythritol, pentaerythritol being more particularly preferred.

The fatty acids of the present invention correspond to the definition generally accepted for these compounds, namely monocarboxylic acids containing only carbon, hydrogen and oxygen elements and consisting of a hydrocarbyl, preferably alkyl, radical attached to the carboxyl group. Among these, the saturated fatty acids of general formula $C_nH_{2n}O_2$ are generally preferred. Methanoic acid and ethanoic acid are the two smallest members of the series, which also comprises palmitic acid and stearic acid. For the purpose of the invention, the fatty acids also encompass the acids of the oleic series, namely of formula $C_nH_{2n-2}O_2$, comprising a double bond, among which acrylic acid represents the one having the smallest number of carbon atoms.

Mention may also be made of the linoleic acid series of formula $C_nH_{2n-4}O_2$ comprising two double bonds and the linolenic acid series of formula $C_nH_{2n-6}O_2$ comprising three double bonds.

Natural fatty acids also exist which have four or more double bonds, as do fatty acids comprising hydroxyl groups in the molecule and cyclic fatty acids. All the fatty acids which have just been mentioned are included in the present invention.

Preferably the product of esterification of the fatty acids and of the polyol, representing the main component of the coating, is obtained by esterification of the polyol described above with at least one fatty acid belonging to the two different groups below:

- (A) at least one fatty acid of a first group having a high melting range (in the region of 70-80°C); and
- (B) at least one fatty acid of a second group having a low melting range (in the region of 24-30°C),

the gap between the melting ranges of groups (A) and (B) being at least 40°C, advantageously at most 60°C.

5 The fatty acid group (A) also comprises saturated or unsaturated fatty acids comprising more than twelve carbon atoms.

10 The latter are advantageously selected from hydrogenated palm and rapeseed fatty acids, and preferably from behenic acid-rich rapeseed oil fatty acids.

15 The fatty acid group (B) advantageously comprises saturated or unsaturated fats having from 1 to 12 carbon atoms; they are advantageously selected from hydrogenated copra fatty acids, octanoic acid, decanoic acid and mixtures thereof.

20 The fatty acid group (B) also comprises acetic acid and lactic acid.

25 The amount of fatty acids (B) advantageously represents from 0 to 50% by weight of the total weight of the fatty acids present in the polyol ester, and the amount of fatty acids (A) generally represents from 50 to 100% by weight relative to the total weight of the fatty acids of the coating composition.

30 The (B)/(A) molar ratio is preferably selected so that it is between 0.8 and 1.5, advantageously between 1 and 1.3.

35 The best results are obtained with coatings also comprising a polycarboxylic acid, the latter preferably being present in the form of a product of esterification of the polyol as described above and of the fatty acids (A) and (B) as described above.

The polycarboxylic acid is advantageously a dicarboxylic acid. Advantageously, the dicarboxylic

acid comprises from 2 to 16 carbon atoms, preferably from 2 to 12 carbon atoms, and an unsaturated, or preferably saturated, hydrocarbon-based, advantageously polyalkylene, chain optionally substituted with hydroxyl or oxo groups.

Mention may be made in particular of sebacic acid, adipic acid, succinic acid, malic acid and oxalic acid.

The amount of polycarboxylic, advantageously dicarboxylic, acid may range up to 20% of the final composition, it being present in free form or advantageously in a form at least partially, and as much as totally, esterified with the polyol described above.

The presence of the polycarboxylic acid makes it possible in particular to reduce the brittle nature at low temperature of the coatings. Depending on the nature of the polycarboxylic, in particular dicarboxylic, acid used, the degree of incorporation of this acid into the polyol ester ranges between 3 and 20%, and preferably between 3 and 10%, relative to the total initial weight of the polycarboxylic acid present in the reaction mixture.

The most advantageous properties are obtained when the carboxylic acid is a dicarboxylic acid comprising a low number of carbon atom, preferably less than 6. Oxalic acid and malic acid are among the acids preferred. The inventors think, without being bound by this theory, that introducing the dicarboxylic acids increases the flexibility of the molecules of the esterification product, either by condensation of the esters on themselves, by virtue of the presence of an additional reactive function borne by the dicarboxylic or polycarboxylic acid, or simply by esterification of an alcohol function of the polyol, with a short-chain dicarboxylic acid.

The amount of polycarboxylic acid added to the starting reaction mixture is adjusted as a function of the molar ratio of fatty acid selected in the range described above.

Coatings which have the most notable characteristics are obtained for an alcohol function/acid function ratio of greater than 1, preferably between 1.0 and 2.0, the acid functions being those of the fatty acids and, where appropriate, of the polyacid.

It is also possible, in order to improve the properties of the coatings of the invention, to add to these coatings an amount ranging up to 20%, advantageously between 5 and 15%, of a plasticizer. Generally, these plasticizers are polymer materials. Mention may be made in particular of copolymers of methacrylate or butyl acrylate and of ethylene, copolymers of vinyl acetate and of ethylene acetate, or other polymer substances miscible with the basic substances and capable of having an influence either on the rheological properties of the coating composition during the coating process, or on the properties of the final coatings themselves.

The coating composition according to the invention may also comprise dyes.

A subject of the invention is also a coating composition for cheeses, wherein it comprises from 60 to 100% by weight of the product of esterification of a polyol containing a branched chain having at least 3 carbon atoms and at least 2 OH groups and

- of at least one fatty acid (A), and
- of at least one fatty acid (B),

the fatty acids (A) having a melting range which is at least 40°C higher than that of the fatty acids (B).

This coating composition advantageously has the characteristics described above in relation to the coating process.

5 The subject of the invention is also a process for preparing a coating composition as defined above, wherein an esterification reaction is carried out between at least one polyol as defined above with at least one fatty acid of a first group (A) and at least
10 one fatty acid of a second group (B) as defined above and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid as defined above, advantageously present in a B/A molar ratio between 0.8 and 1.5, advantageously between 1 and 1.3, and,
15 optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of methacrylate or butyl acrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate, is added to the esterification product obtained.

20 The esterification reaction is generally carried out at high temperature, preferably between 160 and 250°C, more advantageously between 200 and 230°C, in the absence of catalyst. The absence of catalyst makes it
25 possible to simplify the steps of the process and, in particular, to avoid decoloration and the necessity of an additional step for eliminating the catalyst. The plasticizer is preferably added after the esterification reaction, during the cooling of the
30 reaction mixture to lower temperature, preferably to around 150°C. A deodorizing step is generally carried out after the esterification reaction and, optionally, after addition of the plasticizer; it advantageously consists of neutralizing distillation at a temperature
35 of between 200 and 300°C under vacuum.

The composition of the reaction mixture will advantageously be selected within the ranges indicated

above, depending on the properties being sought for the final coating.

5 The crystallization temperature is an important property for the coating of cheeses, in particular in order to allow rapid solidifying thereof after application of the coating composition on the whole cheese or the portions of cheese. It is not desirable to have too high a crystallization temperature, the
10 latter possibly inducing damage to the product at the time of coating and also possibly producing brittle final coatings.

15 The inventors have also demonstrated the fact that the polyol esters according to the invention are not sensitive to the action of pancreatic lipase, unlike the glycerol-derived products of the prior art.

20 The following examples are intended to illustrate the invention.

EXAMPLE 1:

Preparation of a coating composition according to the invention

25 400 g of behenic acid, 200 g of a mixture of octanoic acid and decanoic acid, 120 g of anhydrous oxalic acid and 180 g of pentaerythritol are introduced into a reactor and heated to 80-90°C in order to obtain
30 liquefaction.

The product, maintained with stirring, is heated at 198°C for six hours. The product is then deodorized by being taken to 260°C under 1 to 3 mm Hg for 3 hours.
35 The flow of steam is introduced at the center of the reactor at a flow rate of 15 ml/100 g of mixture/hour, so as to ensure stirring.

A product is obtained which is cream-colored, solid and waxy at room temperature. The physical characteristics of the product are described in Example 1 of Table I.

5 EXAMPLES 2 TO 7:

Six other coating compositions according to the invention are prepared as described above for Example 1.

10

The characteristics of the coatings of Examples 1 to 7, and also the characteristics of coatings of the prior art (comparative examples 1 to 4) are given in Table I below.

TABLE I

Characteristics of the coating compositions

Ex- amples	Characteristics of the reaction mixture											
	Low melting- point fatty acid fraction (B)	% (by wt.)	High melting- point fatty acid fraction (A)	% (by wt.)	Diacid	% (by wt.)	Polyol	% (by wt.)	Plasti- cizer	% (by wt.)	Fraction B/ fraction A molar ratio	Alcohol function/ acid function ratio
1	C8/C10	20.5	Technical grade behenic acid	49	Oxalic acid	12	pentaeryth- ritol	18	0	0	0.9	1.0
2	hydrogen- ated copra	27	Technical grade behenic acid	41	Malonic acid	14	pentaeryth- ritol	18	0	0	1.1	1.0
3	hydrogen- ated copra	32	Technical grade behenic acid	48	0	0	pentaeryth- ritol	20	0	0	1.1	2.0
4	C8/C10	23	Technical grade behenic acid	44	Oxalic acid	14	pentaeryth- ritol	20	0	0	1.1	1.0
5	hydrogen- ated copra	37	Technical grade behenic acid	41	Adipic acid	4	pentaeryth- ritol	18	0	0	1.5	1.5
6	hydrogen- ated copra	36	Technical grade behenic acid	46	Adipic acid	4	pentaeryth- ritol	15	Lotryl 35BA40	10	1.3	1.2
7	C8/C10	37	Technical grade behenic acid	47	0	0	dipenta- erythritol	16	0	0	1.7	1.0

TABLE I
Characteristics of the coating compositions
(continued)

Examples	Melting temperature °C	Crystall- ization temperature	Pene- tration test
1	42	41	59
2	39	41	10
3	55	53	
4	40	42	21
5	38	41	84
6	42	38	80
7	49	40	
Comparative example 1 acetoglycerides ⁽¹⁾	40	34	54
Comparative example 2 acetoglycerides ⁽²⁾	53	46	90
Comparative example 3 acetoglycerides + colophony esters			36
Comparative example 4 wax ⁽³⁾	48	45	99

- 5
- (1) mixture of acetic esters of monoglycerides, diglycerides and triglycerides supplemented with plasticizer
- 10 (2) acetic esters of monoglycerides of hydrogenated plant oil
- (3) mixture of microcrystalline waxes and paraffins

The characteristics given in the table were determined according to the following methods.

- 15
- Measurement of melting and crystallization temperatures by differential thermal analysis with a 2°C min⁻¹ temperature increase cycle

- Penetration test or measurement of the maximum strength as a function of the displacement of the probe
- Number of acid functions per gram of product or acidity: determination by potassium hydroxide-neutralization of the product dispersed in an organic solvent.

EXAMPLES 8 TO 15:

10

The compositions of examples 1 to 7 described above were applied onto uncooked pressed cheeses of small format, of approximately 20 g, by soaking using one or two successive soakings in accordance with the following protocol:

15

- Cheeses tempered at 13°C - 15°C for approximately 2 h
- Temperature of the 1st bath 50-80°C
- Soaking time 0.5 - 2 sec
- 20 • Crystallization time: 10 - 15 seconds
- 2nd bath if necessary; after crystallization, immersion of cheeses in a bath of water at approximately 2°C for 10 minutes; the weight deposited
- 25 ranges between 3.8 and 4.2.

The cheeses covered with their coating are scored according to a scale ranging from 0 to 6:

0 representing poor and 6 representing very good.

30

For the scoring, the following criteria were taken into account:

- appearance: the appearance sought being smooth and dry;
- 35 • feel: the desirable feel being unblemished and not greasy;
- tearing off with the tear-strip: the effect sought being a clean and tidy cut without flaking of the coating;

- extraction of the cheese: the effect sought being easy extraction without the cheese adhering to the shell of coating;
- resistance to breaking: it is desirable to obtain a lack of cracks and splits on the shell of coating when pressure from a finger is applied.

The results are given in Table II below.

- 10 These results show that the coatings according to the invention have an appearance which is superior in quality to the wax-replacement products of the comparative examples (drier appearance, non-greasy feel). Moreover, their properties for use are stable
- 15 over a wider temperature range than the comparative products, corresponding to the temperature ranges of the situations in which the coated products may find themselves given the distribution circuits for these products.

TABLE II

Results

Criteria	1	2	3	4	5	6	7	Comparative example 1 aceto- glycerides	Comparative example 2 aceto- glycerides	Comparative example 3 aceto- glycerides + colophony esters	Comp- arative example 4 wax
A- Temperature of the coating bath (°C)	72	60	65	65	65	72	60	60	58		74
B- Coating weight (g)	3.7-4.0	4.9	5.2	4.7	3.8	3.8	4.7	3.9	3.7-4.0		3.7-4.0
C- Evaluation of the coated cheeses:											
C-1 before opening											
Appearance	6	6	6	6	6	6	6	6	6	6	6
Feel	Dry	greasy sticky	dry	Greasy	Dry	dry	dry	slightly greasy	slightly greasy	very greasy	dry
C-2 upon opening at 4°C											
Tearing off of the tear- strip		6	2	6	4	6	3	6	5	3	6

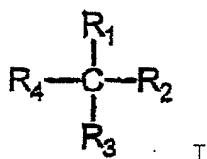
TABLE II

Results (continued)

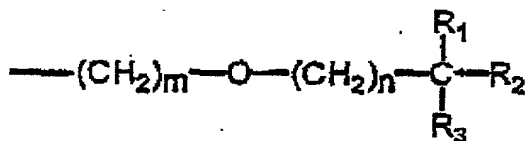
Criteria	1	2	3	4	5	6	7	Comparative example 1 aceto- glycerides	Comparative example 2 aceto- glycerides	Comparative example 3 aceto- glycerides + colophony esters	Comp- arative example 4 wax
Extraction of the cheese		5	5	6	6	6	4	6	6	2	6
Resistance to breaking		5	0	4	2	5	2	5	3	0	5
C-3 upon opening at 20°C											
Tearing off of the tear- strip	5	4	4	6	5	6		6	6		
Extraction of the cheese	5	4	4	5	6	6		5	4		5
Resistance to breaking	5	5	3	5	4	6		6	6		5
C-4 upon opening at 35°C											
Tearing off of the tear- strip		too soft			6	6	6	too soft			5
Extraction of the cheese					6	6	4				5
Resistance to breaking					6	6	2				6

CLAIMS

1. A process for coating cheeses, in particular pressed cheeses, wherein a coating composition is applied onto whole cheeses or portions of cheese, which coating composition comprises from 60% to 100% by weight of a product of esterification of at least one fatty acid and at least one polyol containing a branched chain having at least 3 carbon atoms and at least 2 OH groups.
2. The process as claimed in claim 1, wherein the polyol comprises at least 5 carbon atoms and a saturated hydrocarbon-based chain.
3. The process as claimed in claim 1 or claim 2, wherein the polyol containing a branched chain comprises a neopentyl group.
4. The process as claimed in any one of the preceding claims, wherein the polyol containing a branched chain corresponds to the general formula:



in which R_1 , R_2 , R_3 and R_4 , which may be identical or different, are selected from a C_1 - C_6 alkyl group, in particular a methyl or ethyl group, or a C_1 - C_6 hydroxyalkyl group, in particular a hydroxymethyl group; or R_4 represents a group



m and n, which may be identical or different, being an integer from 1 to 6, advantageously 1 to 3, preferably equal to 1, R_1 , R_2 and R_3 being as defined above, provided that at least two from R_1 to R_4 are a C_1 - C_6 hydroxyalkyl group.

5

5. The process as claimed in claim 1, wherein the polyol is selected from pentaerythritol, neopentyl glycol, trimethylolethane, trimethylolpropane and dipentaerythritol.

10

6. The process as claimed in claim 1, wherein the fatty acids consist of at least one first fatty acid of a group (A) and at least one fatty acid of a second group (B), the group (A) having a melting range at least 40°C higher than that of the group (B).

15

7. The process as claimed in claim 1, wherein the fatty acids (A) are saturated or unsaturated fatty acids having more than 12 carbon atoms.

20

8. The process as claimed in claim 7, wherein the fatty acids (A) are selected from hydrogenated palm and rapeseed fatty acids, and are preferably behenic acid-rich erucic rapeseed oil fatty acids.

25

9. The process as claimed in claim 6, wherein the fatty acids (B) are saturated or unsaturated fatty acids having from 1 to 12 carbon atoms.

30

10. The process as claimed in claim 9, wherein the fatty acids (B) are selected from hydrogenated copra fatty acids, octanoic acid, decanoic acid and mixtures thereof.

35

11. The process as claimed in claim 10, wherein the fatty acids (A) are present at 50 to 100% by weight relative to the total weight of the fatty

acids, and the fatty acids (B) are present at 0 to 50% by weight relative to the total weight of the fatty acids.

- 5 12. The process as claimed in any one of claims 6 to 10, wherein the B/A molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.
- 10 13. The process as claimed in any one of the preceding claims, wherein the coating comprises at least one polycarboxylic, in particular C₃-C₁₆ dicarboxylic, acid esterified with the polyol via one or two of its carboxylic functions.
- 15 14. The process as claimed in claim 13, wherein the dicarboxylic acid is selected from sebacic acid, adipic acid, succinic acid, malic acid and oxalic acid, in a proportion of between 0 and 20% by weight, relative to the total weight of the coating.
- 20 15. The process as claimed in any one of the preceding claims, wherein the alcohol function (of the polyol) to acid function (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, and advantageously between 1 and 2.
- 25 16. The process as claimed in either of claims 13 and 14, wherein the coating composition comprises from 0 to 20% by weight of polycarboxylic, in particular dicarboxylic, acid relative to the total weight of the coating composition.
- 30 17. The process as claimed in any one of the preceding claims, wherein the coating composition contains a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of vinyl acetate and of ethylene acetate.
- 35

18. A coating composition for cheeses, comprising from 60 to 100% by weight of the product of esterification of a polyol containing a branched chain having at least 3 carbon atoms and at least 2 OH groups and

- of at least one fatty acid of a first group (A), and

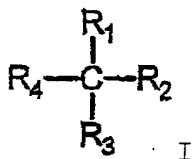
- of at least one fatty acid of a second group (B),

these fatty acids of the group (A) having a melting range at least 40°C higher than that of the fatty acids of the group (B).

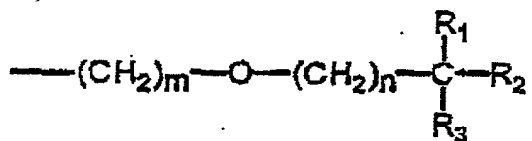
19. The composition as claimed in claim 18, wherein the polyol comprises at least 5 carbon atoms and a saturated hydrocarbon-based chain.

20. The composition as claimed in claim 18, wherein the polyol containing a branched chain comprises a neopentyl group.

21. The composition as claimed in claim 18, wherein the polyol containing a branched chain corresponds to the general formula:



in which R_1 , R_2 , R_3 and R_4 , which may be identical or different, are selected from a C_1 - C_6 alkyl group or a C_1 - C_6 hydroxyalkyl group; or R_4 represents a group



5 m and n, which may be identical or different,
being an integer from 1 to 6, advantageously 1 to
3, preferably equal to 1, R₁, R₂ and R₃ being as
defined above, provided that at least two of R₁ to
R₄ are a C₁-C₆ hydroxyalkyl group.

10 22. The composition as claimed in claim 18, wherein
the polyol is selected from pentaerythritol,
neopentyl glycol, trimethylolethane,
trimethylolpropane and dipentaerythritol.

15 23. The composition as claimed in one of claims 18 to
22, wherein the fatty acids (A) are saturated or
unsaturated fatty acids having more than 12 carbon
atoms.

20 24. The composition as claimed in claim 23, wherein
the fatty acids (A) are selected from hydrogenated
palm and rapeseed fatty acids, and are preferably
behenic acid-rich rapeseed oil fatty acids.

25 25. The composition as claimed in any one of claims 18
to 24, wherein the acids (B) are saturated or
unsaturated acids having from 1 to 12 carbon
atoms.

30 26. The composition as claimed in claim 25, wherein
the carboxylic acids (B) are selected from
hydrogenated copra fatty acids, octanoic acid,
decanoic acid and mixtures thereof.

35 27. The composition as claimed in any one of claims 18
to 26, wherein (A) is present at from 50 to 75% by
weight relative to the total weight of the fatty
acids and (B) is present at 50 to 100% by weight
relative to the total weight of the fatty acids.

28. The composition as claimed in any one of claims 18 to 27, wherein the A/B molar ratio is between 0.8 and 1.5, preferably between 1 and 1.3.
- 5 29. The composition as claimed in any one of claims 18 to 28, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a polycarboxylic acid, in particular a dicarboxylic acid, especially a C₃-C₁₆ dicarboxylic acid, the
10 dicarboxylic acid being present in free form and/or in a form esterified with the polyol.
- 15 30. The composition as claimed in any one of claims 18 to 29, wherein the number of alcohol functions (of the polyol)/number of acid functions (of the fatty acids and of the polycarboxylic acid) ratio is greater than 1, advantageously between 1 and 2.
- 20 31. The composition as claimed in any one of claims 18 to 30, wherein it also comprises from 0 to 20%, advantageously from 3 to 10%, by weight of a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of
25 vinyl acetate and of ethylene acetate.
- 30 32. A process for preparing a coating composition as claimed in any one of claims 18 to 31, wherein an esterification reaction is carried out between at least one polyol as defined in claims 1 to 6 with at least one fatty acid of a first group (A) and at least one acid of a second group (B) as defined in claims 6 to 12 and, optionally, at least one polycarboxylic, in particular dicarboxylic, acid
35 as defined in claims 13 to 15, and, optionally, a plasticizer compatible with foodstuffs, in particular a copolymer of butyl acrylate or butyl methacrylate and of ethylene, or a copolymer of

vinyl acetate and of ethylene acetate, is added to the esterification product obtained.

33. A coated cheese comprising a coating obtained
5 according to the process of claims 1 to 17, or as
defined in claims 18 to 32.

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tions, se référer aux "Notes explicatives relatives aux codes et
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la Gazette du PCT.*

(54) Title: CHEESE COATING COMPOSITION

(54) Titre: COMPOSITION D'ENROBAGE POUR FROMAGES

(57) Abstract: A cheese coating method, in particular pressed paste cheese, is characterised in that it consists in applying on whole cheeses or cheese portions, a coating composition comprising from 60 wt. % to 100 wt. % of an esterifying product of at least a fatty acid and at least a branched polyol having at least 3 carbon atoms and at least two OH groups.

(57) Abrégé: Un procédé d'enrobage de fromages, notamment de fromages à pâte pressée, caractérisé en ce que l'on applique sur des fromages entiers ou des portions de fromage, une composition d'enrobage comprenant de 60 % à 100 % en poids d'un produit d'estérification d'au moins un acide gras et d'au moins un polyol à chaîne ramifiée ayant au moins 3 atomes de carbone et au moins 2 groupes OH.

WO 01/05240 A1

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

COATING COMPOSITION FOR CHEESES

the specification of which: *(check one)*

REGULAR OR DESIGN APPLICATION

- ☐ is attached hereto.
- ☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

- ☒ was described and claimed in International application No. PCT/FR0001742 filed on 22 JUNE 2000 and as amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

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I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

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Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
FRANCE	9909462	21/07/99	YES

(Complete this part only if this is a continuing application.)

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2-00 Full name of second joint inventor, if any: Annie IMBERT
(given name, family name)

Inventor's signature [Signature]

Date 3/01/2002

Residence: 19 Rue R.Degert - 94400 VITRY SUR SEINE - FRANCE
FRX

Citizenship: FRENCH

Post Office Address: The same as above

3-00 Full name of third joint inventor, if any: Jean GRAILLE
(given name, family name)

Inventor's signature [Signature]

Date 07/01/2002

Residence: Le Clos de la Belle - 331, rue Amy Mollison -
34070 MONTPELLIER - FRANCE FRX

Citizenship: FRENCH

Post Office Address: The same as above

4-00 Full name of fourth joint inventor: Michel PINA
(given name, family name)


Inventor's signature [Signature]

Date 07/01/2002

Residence: 6, rue des Tourelles - 34080 MONTPELLIER - FRANCE Citizenship: FRENCH FRX

Post Office Address: The same as above

5- Full name of fifth joint inventor, if any: Serge LAURENT
(given name, family name)

Inventor's signature 

Date 07/01/2002

Residence: 6, rue Jean Giono - 34000 MONTPELLIER - FRANCE FRxCitizenship: FRANCE

Post Office Address: The same as above

Full name of sixth joint inventor, if any:
(given name, family name)

Inventor's signature _____

Date _____

Residence: _____

Citizenship: _____

Post Office Address: _____